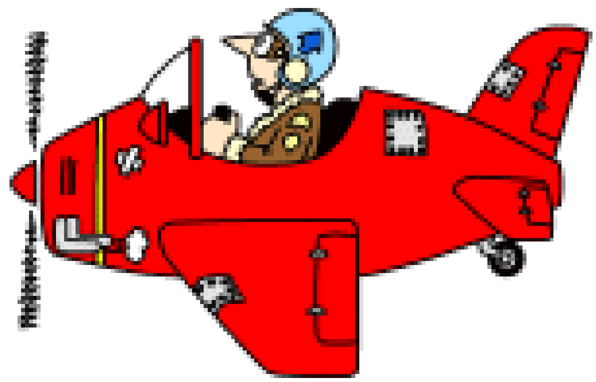

Commercial Maneuvers

Otherwise Known as
Mastering the Beauty of
Flight by Outside References

Contents

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360° Steep Power Turns

Clear the area at 1,500 feet AGL or more.

Set the power to ______________.

Smoothly roll into a bank of 50° +/-5° increasing backpressure as the bank is increased, trim if desired.

Maintain altitude by making small adjustments in pitch and bank. Generally, if the nose of the aircraft is kept on the same position on the horizon, altitude will remain constant.

The addition of some amount of power after the bank is established will elevate the necessity for large amounts of back pressure and demonstrates the pilot understands of the relationship of power and pitch.

If the aircraft starts to descend, increase pitch and/or decrease bank slightly.

If power is added after the bank is established do not adjust the power; only deal with back pressure.

If the aircraft starts to climb, decrease pitch and/or increase bank slightly.

Turns must be done 360°, in each direction.

When approaching the entry heading, (lead rollout by 1/2 the bank angle) smoothly roll out of the bank and release excess backpressure and reduce power if it has been increased once the bank is established.

The bank should be rolled directly from one direction to the opposite direction with no stopping at straight and level.

Keep in mind that, due to torque, turns to the left will require less rudder pressure on entry and more corrective opposite aileron (for over-banking tendency) than turns to the right.

The power used should keep the airspeed above ______KIAS but do not exceed the RPM redline for the engine.

Common errors include a constantly varying altitudes not reducing backpressure/power when rolling out/from one bank to the other bank, and forgetting the entry heading.

1080° Steep Spirals About a Point

The maneuver is a constant radius, power off, steep spiral about a point on the ground, the instructor or examiner may request any number of turns, however 3 complete turns is the normal situation.

Clear the area and normally be at an altitude of 4,000 feet above the ground or higher.

Pick an intersection or other prominent point on the ground.

Carburetor heat, reduce power to idle and establish a glide at _____KIAS.

When abeam of the point, roll into a bank (55° max).

Vary the bank in order to maintain a constant radius. The stronger the wind, the greater the bank variance will be. A stronger wind will also result in a greater altitude loss per 360° of turn.

Clear the engine each 360° of turn.

Roll out on the appropriate heading. Keep in mind a field in case or engine failure.

The most common error is starting too far (more than 1/4 mile) away from the point. This error results in the circles becoming increasingly tighter as altitude is lost.

Chandelles

The maneuver was originally designed to combine a maximum performance climb with a 180° turn, it is now used to improve planning, orientation, coordination and timing.

Clear the area and set power to cruse at 1,500 feet AGL or higher.

Lower the pitch and accelerate up to, but do not exceed, maneuvering speed.

Roll into a 30° bank with a minimum of heading change. Maintain 30° bank for the first 90° turn.

Gradually increase the pitch at a constant rate for the first 90° turn.

As the airspeed starts to decrease, smoothly apply full power (fixed pitch prop).

Upon reaching the 90° point, smoothly begin to roll out the bank, at a constant rate, so that the wings are leveled just as the 180° point is reached. The airspeed at the 90° point should be approx. the same as your approach speed (1.3 times the stall speed).

While turning the last 90°, maintain a constant pitch attitude. If the pitch attitude was attained at the 90° point, and maintained thereafter, the airspeed should be just above stalling speed (i.e. minimum controllable airspeed) at the 180° point.

Lower the pitch and return to straight and level.

When rolling out of a left turning chandelle, only a very small amount of aileron is needed to roll out of the bank, provided the ball is kept centered.

When rolling out of a right turning chandelle, the maneuver must be cross-controlled (i.e. right rudder and left aileron must be held) to keep the maneuver coordinated.

It is absolutely essential that the ball be kept centered during all portions of chandelles and lazy 8's. Failure to do so will render the maneuver unacceptable.

Common errors in a chandelle include excessive heading change when rolling in the 30° bank, improper pitch attitude at the 90° point, and not rolling the bank out at a uniform rate.

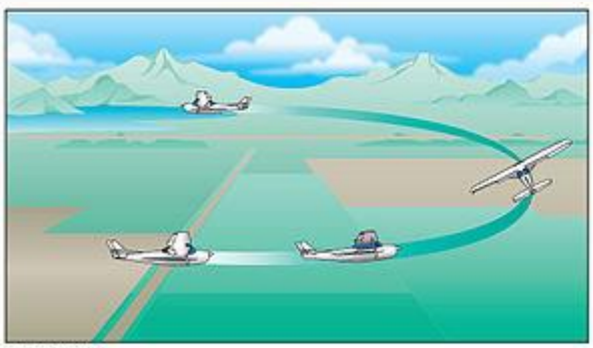


Figure 9-3. Chandelle.

Chandelle from the FAA Publication FAA-H-8083-3A (Airplane Flying Handbook)

The ***chandelle*** is an aircraft control maneuver where the pilot combines a 180° turn with a climb. It is a maneuver designed to show the pilot's proficiency in controlling the aircraft while performing a minimum radius climbing turn at a constant rate of turn (expressed usually in degrees per second) through a 180 degree change of heading, arriving at the new reciprocal heading at an airspeed in the "slow-flight" regime, very near the aerodynamic stall.

The aircraft can be flown in "slow-flight" after establishing the new heading, or normal cruise flight may be resumed, depending upon the purposes of the exercise or examination.

The pilot enters a chandelle at a pre-determined airspeed in the normal cruising range for the aircraft. To begin the maneuver the pilot first rolls the aircraft in the desired direction with the controls (the ailerons), and quickly but smoothly establishes a medium banked turn. In most small aircraft (cruising speeds of 100 - 175 KIAS) this bank will be about 30 to 40 degrees. This will begin a turn of the aircraft in the direction of bank. Simultaneously full power is applied and a smooth pitch up is started with the controls (the elevators on the empennage).

The angle of bank stays constant during the first 90 degrees of the change of heading, while the pitch angle increases steadily. At the 90 degree point in the change of heading, the aircraft has the maximum pitch angle (which should be close to the critical angle of attack at the level stall speed of the aircraft).

During the second 90 degrees of the change of heading, the pitch angle is held constant, while the bank angle is smoothly decreased to reach 0 degrees of bank, the end of the turn and return to straight-and-level flight at exactly the reciprocal (180 degrees away from the heading at the start of the maneuver) heading, and with the airspeed close to the stall speed.

The aircraft should not lose altitude during the last part of the maneuver, nor during the recovery, when engine power may be used to re-establish normal cruising speed on the new heading. The decreasing bank angle together with the decreasing airspeed during the second half of the chandelle will maintain a constant turn rate. The turn needs to be kept coordinated by applying the correct amount of rudder throughout the maneuver.

Lazy Eights

The maneuver is best described as a climbing turn of ever increasing bank followed by a diving turn of ever shallowing bank until the 180° point is reached where the procedure is immediately repeated in the opposite direction. At no time during the maneuver is the airspeed/attitude/control deflection constant.

The maneuver gets its name from the arc the longitudinal axis makes on the horizon during the maneuver i.e. a figure 8 laying on its side, or a "lazy" eight.

Prior to starting the maneuver, clear the area at 1,500 feet AGL or greater.

Enter the maneuver from straight and level cruise flight.

Simultaneously increase both the pitch and the bank for the first 45° of turn. (45° point) The bank should be 15° at this point.

The pitch will be at its highest point at the 45° of turn (heading change per units of time) will be quite slow the first 45° turn.

During the second 45° of turn, the pitch decreases, while the bank increases, the altitude continues to increase, and the airspeed continues to decrease. The rate of turn during this portions of the maneuver will be quite fast.

At the 90° point, the pitch should be passing through the level flight attitude for that airspeed, altitude is a maximum, bank should be 30°, and airspeed is a minimum, being 5-10 KIAS above a stall.

During the third 45° of turn, the rate of turn is still quite fast, requiring a fast response time from the pilot. The pitch continues to decrease to its lowest point at the 135° point, the bank continues to decrease, and the airspeed continues to increase.

During the last 45° of turn, the rate of turn is very slow. The pitch continues to increase back to the level flight attitude, bank decrease to zero at the 180° point, altitude continues to descend back to the entry altitude, and airspeed continues to increase, until reaching the 180° point.

The altitude gained during the first 90° of turn should equal the altitude lost during the second 90° of turn, so that the aircraft returns to the starting altitude.

Upon reaching the 180° point, the procedure is immediately performed in the opposite direction. One complete lazy 8 consists of two 180° turns.}

As proficiency level is increased, lazy 8's may be practiced at various bank maximums, up to 60°

Common errors include not keeping the ball centered, especially approaching the 90° point when turning to the right, not constantly varying the bank and pitch, and gaining or losing altitude.

Objective of the Lazy 8 is to develop the pilot's feel for varying control forces, and the ability to plan and remain oriented while maneuvering the airplane with positive, accurate control. It requires constantly changing control pressures necessitated by changing combinations of climbing and descending turns at varying airspeeds.

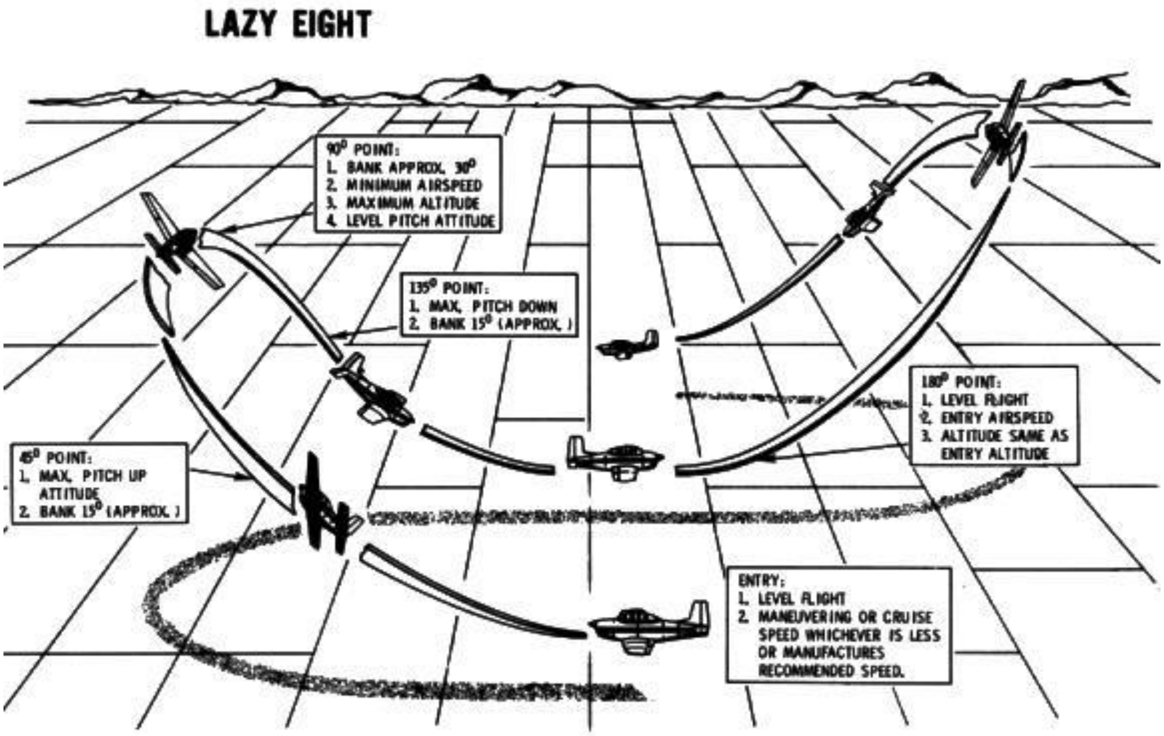


Figure 11-82 Lazy Eight

A "Lazy 8" consists of two 180 degree turns, in opposite directions, while making a climb and a descent in a symmetrical pattern during each of the turns. At no time throughout the Lazy 8 is the airplane flown straight and level; instead, it is rolled directly from one bank to the other with the wings level only at the moment the turn is reversed at the completion of each 180 degree change in heading.

As an aid to making symmetrical loops of the 8 during each turn, prominent reference points should be selected on the horizon. The reference points selected should be 45 degrees, 90 degrees, and 135 degrees from the direction in which the maneuver is begun.

The maneuver should be entered from straight and level flight at normal cruise power and at the airspeed recommended by the manufacturer or at the airplanes design maneuvering speed.

The maneuver is started from level flight with a gradual climbing turn in the direction of the 45 degree reference point. The climbing turn should be planned and controlled so that the maximum pitch up attitude is reached at the 45 degree point. The rate of rolling into the bank must be such as to prevent the rate of turn from becoming too rapid. As the pitch attitude is raised the airspeed decreases, causing the rate of turn to increase. Since the bank also is being increased, it too causes the rate of turn to increase. Unless the maneuver is begun with a slow rate of roll, the combination of increasing pitch and increasing bank will cause the rate of turn to be so rapid that the 45 degree reference point will be reached before the highest pitch attitude is attained.

At the 45 degree point, the pitch attitude should be at maximum and the angle of bank continuing to increase. Also, at the 45 degree point, the pitch attitude should start to decrease slowly toward the horizon and the 90 degree reference point. Since the airspeed is still decreasing, right rudder pressure will have to be applied to counteract torque.

As the airplane's nose is being lowered toward the 90 degree reference point, the bank should continue to increase. Due to the decreasing airspeed, a slight amount of opposite aileron pressure may be required to prevent the bank from becoming too steep. When the airplane completes 90 degrees of the turn, the bank should be at the maximum angle (approximately 30 degrees), the airspeed should be at its minimum (5 to 10 knots above stall speed), and the airplane pitch attitude should be passing through level flight. It is at this time that an imaginary line, extending from the pilot's eye and parallel to the longitudinal axis of the airplane, passes through the 90 degree reference point.

Lazy 8's normally should be performed with no more than approximately a 30 degree bank. Steeper banks may be used but control touch and technique must be developed to a much higher degree than when the maneuver is performed with a shallower bank.

The pilot should not hesitate at this point but should continue to fly the airplane into a descending turn so that the airplane's nose describes the same size loop below the horizon as it did above. As the pilot's reference line passes through the 90 degree point, the bank should be decreased gradually, and the airplane's nose allowed continuing lowering. When the airplane has turned 135 degrees, the nose should be in its lowest pitch attitude. The airspeed will be increasing during this descending turn so it will be necessary to gradually relax rudder and aileron pressure and to simultaneously raise the nose and roll the wings level. As this is being accomplished, the pilot should note the amount of turn remaining and adjust the rate of rollout and pitch change so that the wings become level and the original airspeed is attained in level flight just as the 180 degree point is reached. Upon reaching that point, a climbing turn should be started immediately in the opposite direction toward the selected reference points to complete the second half of the eight in the same manner as the first half.

Due to the decreasing airspeed considerable right rudder pressure must be gradually applied to counteract torque at the top of the eight in both the right and left turns. The pressure will be greatest at the point of lowest airspeed.

More right rudder pressure will be needed during the climbing turn to the right than in the turn to the left because more torque correction is needed to prevent yaw from decreasing the rate of turn. In the left climbing turn the torque will tend to contribute to the turn; consequently, less rudder pressure is needed. It will be noted that the controls are slightly crossed in the right climbing turn because of the need for left aileron pressure to prevent over banking and right rudder to overcome torque.

The correct power setting for the lazy eight is that which will maintain the altitude for the maximum and minimum airspeeds used during the climbs and descents of the eight. Obviously, if excess power were used, the airplane would have gained altitude when the maneuver is completed, while if insufficient power were used, altitude would have been lost.

Eights-on-pylons or Pylon Eights

Adapted from an article by William K. Kershner

Envision trying to count 300 antelope grazing on an open plain. If there is any wind at all and you circle the antelope using a ”turns around a point” private pilot maneuver, the counter will not only have great difficulty in completing the count, but often becomes airsick. This is because using the ”turn around a point” private pilot maneuver, the point of focus of the counter (the stationary antelope) constantly moves forward of the wing then the antelope moves behind the wing as the aircraft circles the antelope. Enter the pylon turn.

In the pylon turn the counter’s focus on the grazing antelope remains fixed on a point abreast of the wing. The antelope does not appear to migrate forward of the wing then back of the wing in the pylon turn. It allows the counter to complete his job more easily and is much easier to stomach. This result is accomplished by varying the altitude above the ground as the aircraft circles the antelope.

This ground reference maneuver involves flying the airplane in circular paths, alternately left and right, in the form of a figure "8" around two selected points or "pylons" or antelope on the ground. No attempt is made to maintain a uniform radius from the pylon and a measureable wind is necessary to emphasize the factors involved.

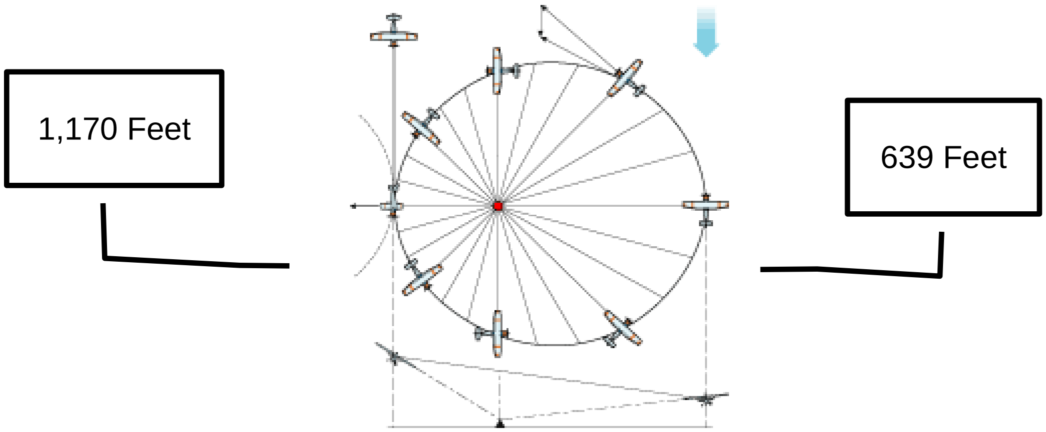
The airplane is flown at such an altitude and airspeed that a line parallel to the airplane's lateral axis (straight down the wing) and extending from the pilot's eye to the tip of the wing, appears to pivot on each of the pylons or antelope.

The altitude flown is constantly changing and at any point in time is called the "pivotal altitude". Pivotal altitude is governed by groundspeed according to the formula:

Pivotal altitude = (ground speed) ^{2} / 11.3

With a 100 KTAS and a 15 Knot wind this translates to:

Down wind pivotal altitude =	1,170’
Up wind pivotal altitude =	639’
Altitude difference =	531’



If effect, when at the proper pivotal altitude, the airplane appears to pivot on the antelope.

The pivotal altitude does not vary with the angle of bank.

The eight is usually begun by flying diagonally crosswind between the pylons or antelope with the wind behind the aircraft.

The pylons MUST be selected such that a straight line between the pylons is perpendicular to the wind and should be entered downwind between the two pylons.

As the airplane drifts closer to the pylon, the angle of bank must be increased to hold the reference line on the pylon.

If the antelope appears to move behind the wing, the pilot should increase altitude. If the antelope appears to move ahead of the wing, the pilot should decrease altitude.

There should be a few seconds of straight and level time between pylons.

The most common error in attempting to hold a pylon is incorrect use of the rudder.

The maximum bank angle should be between 30° and 40°.

The distance between the pylons should be about 1 mile for 100 knots of groundspeed.

Eights on pylons are one of the best exercises for teaching the pilot to fly the airplane automatically by reference to outside points and to control the altitude without referring to the horizon.

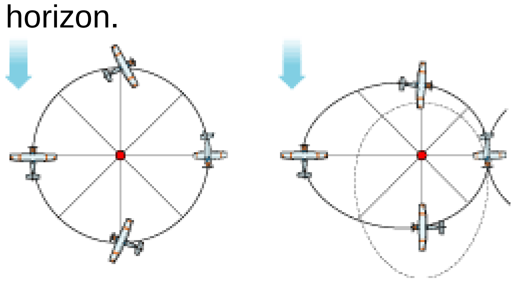


Figure 1 shows the difference between turns around a point and the on-pylon eight (one pylon) with a wind. The interesting point is that the on-pylon pattern is *not* as shown by the dashed line, but by the solid one, with its major axis parallel to the line between two pylons or perpendicular to the wind, as shown by Figure 2.

Figure 1

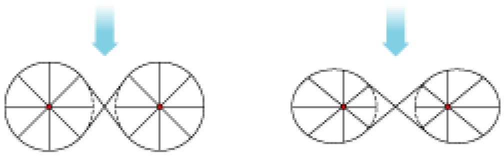


Figure 2

The pylons are picked so that straight-and-level flight between the halves is required. (A good estimate is for a four- or five-second straightaway)

The pivotal altitude is that altitude at which the pylon will remain in a constant position relative to the pilot's line of sight (parallel to the lateral axis of the airplane down the wing). It is dependent on the relative speed of the airplane to the pylon and so will vary around the pylon except in a no-wind condition. (The path would be a circle in that case)

The pivotal altitude may be found by the equation (V^2 knots)/11.3.

The V is the relative velocity to the pylon (true airspeed in no-wind conditions, ground speed when the wind is blowing).

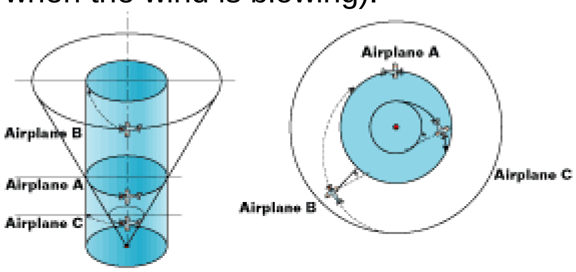


Figure 3

Figure 3 shows three airplanes starting to fly around a pylon in no-wind conditions and 60-degree bank at different altitudes at 106 knots true airspeed. Only one of the three is at the proper pivotal altitude, given as 1,000 feet (rounded off) for this problem. At a 60-degree bank only Airplane A fits the cone since the shaded area shows the turn radius of the airplanes at 106 kt. Airplane B is too high and will be turning into the pylon (the pylon will be moving forward of the line of reference), while Airplane C is too low and "gaining" on the pylon. Each airplane must move to the proper pivotal altitude of Airplane A in order to fit on the 60-degree cone. This procedure works for any angle of bank since the pivotal altitude depends only on the relative speed of the airplane to the pylon.

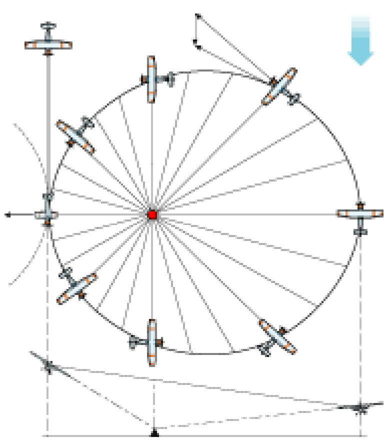


Figure 4

Figure 4 shows the path of a theoretical airplane around one pylon. The steepest bank and highest altitude are found when the airplane is flying directly downwind; the opposite occurs when flying directly upwind. The wing (more properly, your line of sight) is always pointed at the pylon and the path is a modified ellipse as shown. In a tandem airplane the occupants will have different "lines of sight."

Assuming a constant power setting, if the pylon is moving behind the reference line (wing), up-elevators play a dual role by moving the airplane up toward the pivotal altitude (if you aren't flying the pylons on the back side of the power curve) as well as helping to slow the airplane as you attain the proper height/speed combination.

If the pylon is moving ahead of the reference line (wing), the elevators are used to ease the nose down to increase the airspeed and lower the altitude, again getting a double effect of "catch up."

Keep an eye out for any traffic that is crossing your path, or is performing on-pylon eights using the same pylons!

Power-Off Approaches

Introduction

Power-off approaches are made by gliding an airplane with the engine(s) idling to a selected point on the runway. The objective is to develop the skills required to execute a gliding approach from traffic pattern altitude and land safely on a specified touchdown point with a degree of accuracy.

The ability to estimate accurately the distance an airplane will glide to a specific point will determine the amount of maneuvering that may be required from a given altitude. With practice, altitudes up to 1,000 feet above ground level can be estimated with fair accuracy by learning to associate the indications of the altimeter with the general appearance of the terrain. Above this altitude, the estimation of heights becomes less precise, as all features on the ground tend to merge.

Early on in flight training, during the practice of descents and, prior to the first solo, when conducting simulated engine failures in the traffic pattern, selecting and maintaining the proper glide speed and angle is practiced and reinforced.

Eventually, the judgment of altitudes becomes less important than the ability to estimate the glide angle. The pilot who knows the glide angle of an airplane can, with reasonable accuracy, estimate the approximate spot along a given ground path where it will land, regardless of altitude, and then judge how much maneuvering is possible or required during the glide.

Safety Considerations

Although some of the skills required to perform these maneuvers are similar to those demonstrated during forced landings, power-off approaches are not emergency procedures. Therefore, procedures required by aircraft manufacturers to safely land an airplane without power in an emergency are not used during this maneuver.

The main objective of an accuracy approach is to complete a safe landing. Forcing an aircraft that is approaching too high or too fast onto a desired landing area will always sacrifice some degree of safety. Pilots should decide early whether a safe touchdown could be achieved. When demonstrating the 180º accuracy approach and landing (for example, on a commercial pilot flight test), the decision to overshoot must be favored over the risks of a potential undershoot or short and unsafe landing.

It is very important to pay attention to engine operating temperatures when carrying out maneuvers with decreased power settings. Prolonged operation without engine power, especially in colder temperatures, may require the periodic application of power to warm the engine. One application of power should be sufficient to maintain safe engine operating temperatures, during the practice of a power-off 180° accuracy approach.

To protect the engine in very cold conditions, it can be acceptable to use a low power setting and partial flap (in order to compensate for the added thrust) and simulate power-off gliding performance. As this may change the glide attitude and limit the range of flap left available for corrections, this technique should only be used to protect the engine.

Carburetor heat must be used as specified by the manufacturer during prolonged approaches so that additional power would be available when required to correct an undershoot or initiate an overshoot.

Pilots should ensure that other traffic is not inconvenienced by the maneuvers required to conduct this type of approach and that air traffic service, where it is provided, is kept informed of the pilot’s intentions.

General

The objective of a successful approach is to position the airplane in the desired landing area at an airspeed that results in the expected amount of floating before touchdown. In order to accomplish this, the flight path, approach airspeed, and glide angle must be accurately controlled.

he glide angle can be steepened with the use of flaps, small pitch adjustments or sideslips. Raising the pitch attitude in a low approach, in an attempt to ‘stretch’ the glide, will cause the airplane to sink more rapidly due to a lower airspeed that results in diminished lift, moving the desired touchdown point out of reach. Lowering the pitch attitude in a high approach increases airspeed, forcing the airplane to float past the desired touchdown point. It is therefore very important to judge the approach accurately and make adjustment decisions early in order to achieve a safe, successful landing.

Uniform approach patterns such as the straight-in, 90° and 180° power-off accuracy approaches are described in the next sections. Practice in these approaches provides the pilot with a basis on which to develop judgment in gliding distance and in planning an approach.

It must be emphasized that, although accurate spot touchdowns are gratifying, safe and properly executed approaches and landings are more important. Pilots must not sacrifice procedures in order to land on a desired spot.

Straight-in Gliding Approach

The skills required to execute a successful gliding approach to a desired landing area are developed during basic descent training. It is during this phase of training that pilots learn to estimate gliding distances using visual cues.

Positions on the ground that appear to move down a fixed point on the windshield are ground positions that you can reach and fly over, with altitudes to spare.

The position on the ground that remains stationary in relation to the fixed point on the windshield is the ground position that your aircraft should reach.

Positions on the ground that move up from a fixed point on the windshield are ground positions that your aircraft cannot reach.

These simple observations should be used whenever estimating the power-off gliding range of an airplane or attempting a power-off gliding approach to a desired landing spot on a runway.

As the power remains in the idle position for this approach, adjustments in glide angle and distance are possible through pitch changes, flap settings, and slipping, all of which can result in airspeed changes. These airspeed changes must be carefully considered:

Pitching up from a glide attitude to correct a low approach will decrease the airspeed and the gliding range, resulting in wheel contact before the desired landing area. In this situation, it would be better to overshoot and try again.

Pitching down from a glide attitude to correct a high approach will increase the airspeed and diminish the gliding range, resulting in additional lift that may carry the aircraft beyond the desired landing area. In this situation, it would be better to lower flaps or slip to reposition the airplane on the appropriate glide path.

In all cases, it is recommended to carry out a missed approach and try again, whenever a pilot is not satisfied with the situation.

This is not an emergency procedure and a landing in the desired area does not have to be achieved every time. The power-off approaches discussed here require practice and experience to master. To develop the judgment required to successfully reach the desired landing area every time, the straight-in gliding approach should be practiced from different altitudes, distances from the runway, and under various wind conditions.

90° Power-Off Approach

The 90° power-off approach is made from the base leg and requires only a turn onto the final approach. The approach path may be varied by moving the base leg closer to or farther out from the approach end of the runway, depending on wind conditions (Figure 1).

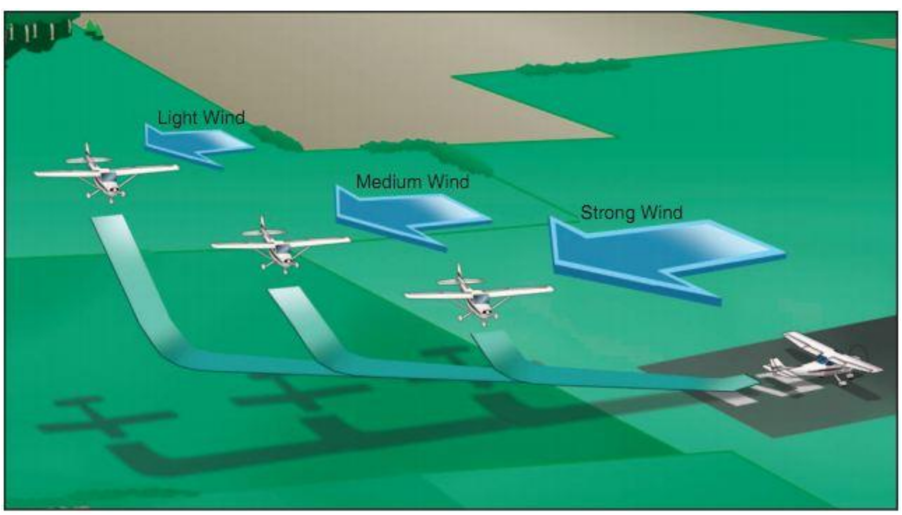


Figure 1

The glide from the key position on the base leg through a turn to the final approach is the final part of most accuracy landing maneuvers.

The 90° power-off approach begins from a rectangular traffic pattern at approximately 1,000 feet above the ground. The airplane should be flown onto a downwind leg at approximately the same distance from the runway as in a normal traffic pattern. If appropriate to the airport procedures and when some proficiency has been achieved, the procedure can be attempted when joining straight into the base leg. The before-landing checklist should be completed on the downwind leg, including extension of the landing gear, if so equipped.

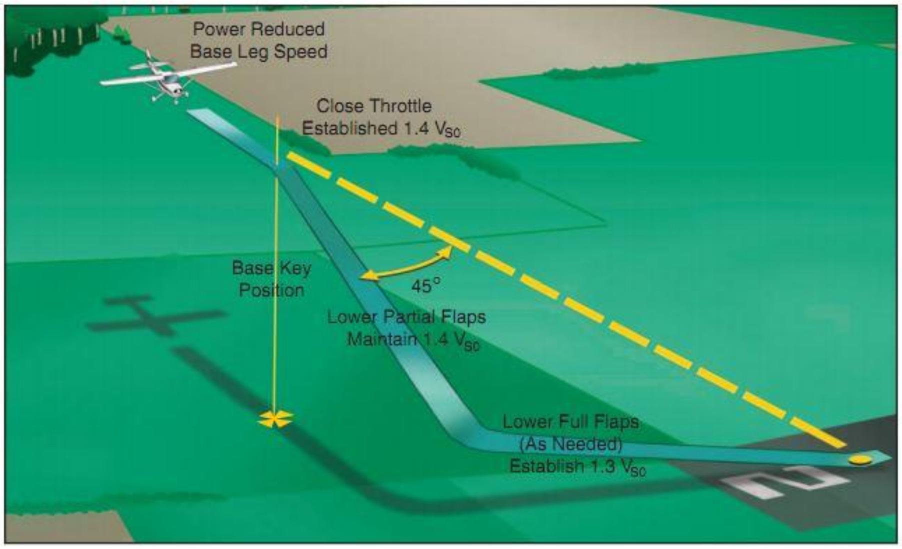


Figure 2

After a medium banked turn onto the base leg is completed, power is reduced slightly and the airplane is decelerated to the normal base leg speed (Figure 2). On the base leg, the airspeed, wind drift correction, and altitude should be maintained while proceeding to the 45° position. At this position, the landing area will appear to be on a 45° angle from the airplane's nose.

The pilot can determine the strength and direction of the wind from the amount of crab necessary to hold the desired ground track on the base leg. This will help in planning the turn onto the final approach and in lowering the correct amount of flaps.

At the 45° key position, the throttle should be closed completely, the propeller control (if equipped) advanced to high RPM, and altitude maintained until the airspeed has decreased to the manufacturer's recommended glide speed. In the absence of a recommended speed, 1.4 Vso may be used. When the desired airspeed is attained, pitch should be adjusted to maintain the glide speed and then the controls should be trimmed.

The base-to-final turn should be planned so that the airplane will be aligned with the runway centerline upon completion. On final approach, visual cues, as explained earlier, should be used to determine the touchdown point. Flaps or slipping can then help to move that touchdown point, as necessary, to the desired landing area. Slight adjustments to both the pitch attitude and the trim may be required to maintain the proper glide angle and airspeed. Once the final approach glide has been established, attention can be directed to landing rather than concentrating on the touchdown point. Pilots must keep in mind that it is better to execute a safe landing 400 feet from the intended touchdown point than to force the airplane into a poor landing, precisely on the mark.

<u>180° Power-Off Approach</u>

This approach is executed by gliding with the power off from a given point on the downwind to a pre-selected landing area. It is an extension of the principles involved in the 90° power-off approach. Its objective is to further develop judgment in estimating distances and glide ratios.

The 180° power-off approach requires more planning and judgment than the 90° power-off approach. This type of approach should be started from the downwind, usually 1,000 feet above the ground.

The throttle is reduced to idle and altitude is maintained while the airplane is decelerated to the manufacturer's recommended glide speed or 1.4 Vso when abeam the desired landing spot, at the downwind key position (Figure 3).

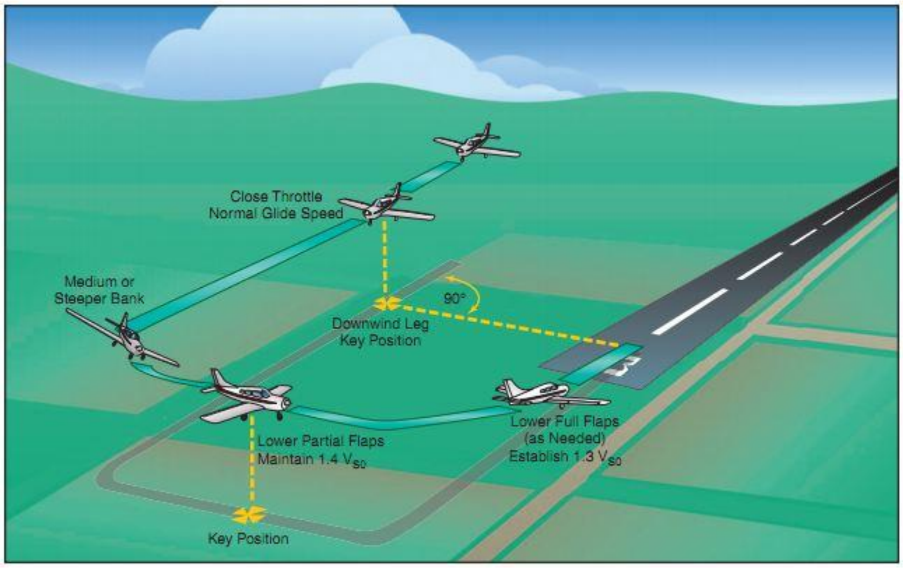
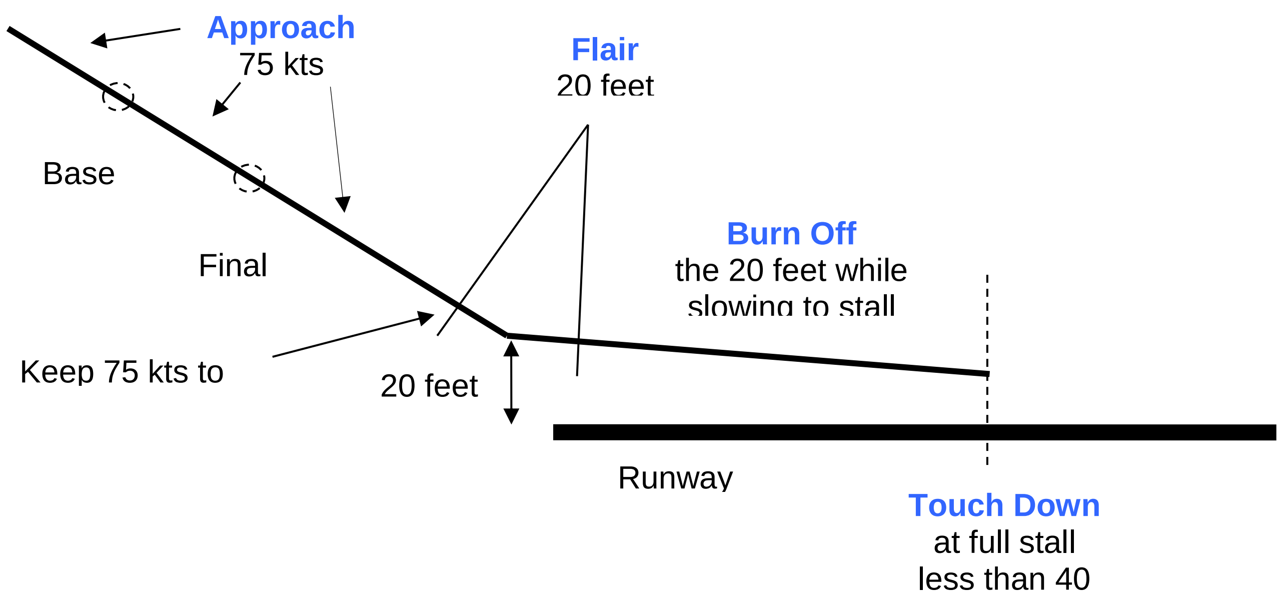


Figure 3

The bank angle, when turning from the downwind leg to the base leg, will depend upon the glide angle and the velocity of the wind. This turn should be distanced as needed for the altitude and wind conditions. The turn onto the base leg should be made at an altitude high and close enough to glide the airplane to what would normally be the base key position in a 90° power-off approach. Although the key position is important, it must not be overemphasized nor considered as a fixed point on the ground. Many inexperienced pilots may think of it as a particular landmark in the traffic pattern, such as a tree, a crossroad, or other visual reference, to be reached at a certain altitude. This may leave the pilot at a loss any time such objects are not present. Both altitude and geographical location should be varied as much as practical to eliminate such habits.

After reaching the base key position, the approach and landing are the same as in the 90° power-off approach.

Full Stall Landing Profile



<u>Setup Abreast of Target Point:</u>
1) Power 1700 RPM
2) Hold Altitude to White Arc
3) 1 Notch of Flaps
4) Slow to 70 kts & descend

<u>Judgment Calls After Setup:</u>
1) Additional Flap Extensions
2) Power Reductions
3) Initiating Turns
GOAL Touch Down at Target Point